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**Claims**

1. Method for conversion of waveguide modes from a mode of type  $TM_{01}$  to mode of type  $TE_{11}$  for transmission of power within the microwave range, characterized in that incoming power of mode type  $TM_{01}$  is divided between two or more waveguides with cross-sections essentially in the shape of circle sectors, in that the divided power is phase-shifted by the waveguides in a subsequent phase-shift section by means of waveguides with cross-sections essentially in the shape of circle sectors being designed with different radii, after which the waveguides are changed into a common essentially circular waveguide that emits an outgoing power of mode type  $TE_{11}$ .

2. Method according to Claim 1, characterized in that the conversion of the waveguide mode from mode type  $TM_{01}$  to mode type  $TE_{11}$  is caused, in an intermediate stage comprising four separate waveguides, to assume a field configuration for the basic modes of the respective waveguides that constitutes one quarter of a so-called  $TE_{21}$  mode in a corresponding circular waveguide.

3. Mode-converting arrangement for conversion of waveguide modes from a mode of type  $TM_{01}$  to mode of type  $TE_{11}$  for transmission of power within the microwave range, comprising an incoming waveguide for reception of power of the type  $TM_{01}$ , an outgoing waveguide for outputting power of the mode type  $TE_{11}$  and a waveguide-mode-converting section arranged between the incoming and outgoing waveguides, characterized in that the waveguide-mode-converting section comprises at least one input section for dividing the received power into two or more components and a phase-shift section at the output side of the input section with an allocated waveguide for each power component, with the waveguides being designed with cross-sections that are essentially

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in the shape of circle sectors with different radii emanating from a common centre and such that the cross-sections in the shape of circle sectors together essentially cover 360 degrees.

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4. Mode-converting arrangement according to Claim 3, characterized in that the phase-shift section is dimensioned to have a length in the transmission direction of at least  $\lambda_0/4$  and, for example, of the 10 order of  $2\lambda_0$ , where  $\lambda_0$  denotes the free-space wavelength of the centre frequency in the band that is transmitted by the arrangement.

15 5. Mode-converting arrangement according to any one of Claims 3-4, characterized in that a mode-mixer section is included in connection with the outgoing waveguide, which mode-mixer section comprises a change from a plurality of waveguides with cross-sections in the shape of circle sectors to one waveguide with an 20 essentially circular cross-section.

25 6. Mode-converting arrangement according to Claim 5, characterized in that the change in the mode-mixer section can be designed to be abrupt.

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7. Mode-converting arrangement according to Claim 5, characterized in that the change in the mode-mixer section is designed to be gradual, by the change having an extent in the transmission direction that 30 corresponds to at least  $\lambda_0/4$ , where  $\lambda_0$  denotes the free-space wavelength for the centre frequency in the band that is transmitted by the arrangement.

35 8. Mode-converting arrangement according to any one of Claims 5-7, characterized in that the output of the mode-mixer section forms the outgoing waveguide of the arrangement.

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9. Mode-converting arrangement according to any one of the preceding Claims 3-8, characterized in that a balance section is included, connected to the output side of the phase-shift section and comprising  
5 waveguides with cross-sections that are essentially in the shape of circle sectors with the same radii, in order to balance the field configurations of the waves that leave the different waveguides of the phase-shift section.

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10. Mode-converting arrangement according to any one of the preceding Claims 3-9, characterized in that an intermediate section is arranged between the input section and the phase-shift section, which intermediate  
15 section comprises a plurality of waveguides with cross-sections in the shape of circle sectors and essentially identical radii.

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11. Mode-converting arrangement according to any one of the preceding Claims 3-10, characterized in that the input section is designed to divide the received power into two components.

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12. Mode-converting arrangement according to any one of the preceding Claims 3-11, characterized in that the input section is designed to divide the received power into four components.

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13. Mode-converting arrangement according to any one of the preceding Claims 3-12, characterized in that the input section comprises thin ridges for dividing the received power, which ridges increase in size in the transmission direction from the periphery of the input section inwards towards the middle of the input section  
35 so that they meet at the output side of the input section.

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14. Mode-converting arrangement according to Claim 13, characterized in that the ridges are designed to increase in size continuously in the transmission direction.

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15. Mode-converting arrangement according to Claim 13, characterized in that the ridges are designed to increase in size in steps in the transmission direction.

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16. Antenna arrangement comprising a mode-converting arrangement according to any one of Claims 3-15.